

HYPERTENSION BOARD REVIEW 2004

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OVERVIEW

- **Utilize in-training examination and AAFP core content review questions to help review:**
 - **General facts and key messages**
 - **Blood pressure (BP) measurement and clinical evaluation**
 - **Prevention and treatment of high BP**
 - **Special populations and situations**
- **Discuss and compare any major changes in the above in JNC VII**

GENERAL FACTS

- **JNC VI (Joint National Committee sixth report) 1997**
- **JNC VII (express) May 2003**
- **JNC VII (full report) Dec 2003**

Why JNC VII?

- **Many new HTN trials since JNC VI in 1997**
- **Need for concise guideline and simplification of BP classification**
- **Recognition that the JNC reports did not result in maximum benefit to the public**
 - **2/3 of HTN patients still have BP >140/90**
 - **Rate of decline of death from CHD and stroke has slowed**
 - **HF prevalence and hospitalizations increasing**
 - **ESRD diagnosis increasing**

GENERAL FACTS

- **A 40 y/o sedentary WM with a FmHx of stroke sees you for a health maintenance visit. His BP=150/100 mmHg and an LDL cholesterol of 170 mg/dl**
- **Which one of the following would have the greatest impact on decreasing his future risk of stroke?**
 - A) A program of regular physical exercise**
 - B) Aspirin 81 mg daily**
 - C) Reduction of LDL to <130 mg/dl**
 - D) Reduction of BP to normal**

GENERAL FACTS

Answer:

D) Reduction of BP to normal

- **Stroke is the 3rd leading cause of death in the US**
- **HTN is the most consistently powerful predictor of stroke**
 - Primary prevention of stroke. *N Engl J Med* 1995
- **Lowering BP results in 35-40% reduction in stroke incidence**

NEW FEATURES AND KEY MESSAGES

- **Hypertension (HTN) affects 50 million in U.S and one billion worldwide**
- **If normotensive at age 55 →**
 - **90 % lifetime risk for developing HTN**
- **BP and risk of CVD events is continuous, consistent, and independent of other risk factors**
 - **Risk of CVD beginning at 115/75 mmHg doubles with each increment of 20/10**

NEW FEATURES AND KEY MESSAGES

- **SBP is a more important CVD risk factor than DBP except in patients younger < 50**
- **If BP is >20/10 mmHg above goal, drug therapy should be initiated with two agents**
 - One usually should be a Thiazide-type diuretic
- **Motivation improves compliance**
 - Motivation improves with trust in the clinician
 - *Empathy builds trust → potent motivator*

CLASSIFICATION

JNCVI

<u>Category</u>	<u>Systolic BP</u>	<u>Diastolic</u>
<u>BP</u>		
• Optimal	<120 and	<80
• Normal	<130 and	<85
• High-normal	130-139	or
85-89		
• HTN		
-Stage 1	140-159	or 90-
	(67%)	
-Stage 2	160-179	or 100-
	(22%)	
109		
Stage 3	>180	or >110

CLASSIFICATION

JNCVII

<u>Category</u>	<u>Systolic BP</u>	<u>Diastolic BP</u>
• Normal	<120 and	<80
• PREHTN	120-139	or 80-90
• Hypertension	-Stage 1 140-159	or 90-99
	-Stage 2 ≥ 160	or ≥ 100

BP MEASUREMENT

Which of the following factors can lower blood pressure readings?

- A) Obese extremities**
- B) Caffeine ingestion**
- C) Narrow BP cuff**
- D) Supporting the patient's back**



BP MEASUREMENT

Answer:

D) Supporting the patient's back

- relaxes the body, lowering BP an avg of 8 mmHg SBP and DBP

Obese extremities

Caffeine ingestion can result in
false Narrow BP cuff elevations

BP MEASUREMENT

- **Measurement of BP should be obtained:**
 - **In all adults (age >18) at each visit**
 - **> 30 minutes after use of nicotine or caffeine**
 - **After 5 minutes of rest with arm supported at heart level**
 - **With *appropriate sized cuff***
 - **bladder should encircle 80% of the arm**

BP MEASUREMENT

- **Measurement of BP should be obtained:**
 - **Twice, at least two minutes apart**
 - **repeat if >5 mm pressure difference**
 - **With patient seated with feet flat on floor, back and arm supported, and arm at heart level**
 - **Use manual mercury sphygmomanometer or recently calibrated aneroid manometer or validated automated device (JNCVI and VII)**

BP MEASUREMENT

- **Ambulatory Blood Pressure Monitor (ABPM) is warranted for evaluation of “white-coat” HTN in the absence of target organ injury**
 - It is also helpful to assess patients with:
 - apparent drug resistance
 - hypotensive symptoms with antihypertensives
 - episodic HTN
 - autonomic dysfunction
 - **Correlates better than office measurements with target organ injury**
 - **BP should drop 10 to 20% during the night**
 - If not → increased risk for CV events

BP MEASUREMENT

- **Self measurement of BP**
 - An avg BP more than 135/85 mmHg measured at home is generally considered to be hypertensive
 - Wrist and finger manometers are not recommended



CLINICAL EVALUATION

Which one of the following would be most likely to have secondary HTN?

- A) 39 y/o WM who weighs 119 kg and BP=142/94**
- B) 48 y/o AAF with LVH on echo and BP=162/98**
- C) 62 y/o AAM with a strong FmHx of HTN**
- D) 78 y/o WF with abdominal bruits and BP=182/102**
- E) 88 y/o WM with hemiparesis due to previous stroke whose BP=192/88**

CLINICAL EVALUATION

Answer:

**D) 78 y/o WF with abdominal bruits
and BP is 182/102 mm Hg**

Objective of the clinical evaluation:

- 1) Identify other CV risk factors**
 - assess lifestyle and concomitant disorders that may affect prognosis and guide treatment**
- 2) To reveal identifiable causes of high BP and**
- 3) To assess the presence or absence of target organ damage and CVD**

Major Risk Factors

JNCVI

- Age > 60 years
- Sex (men and postmenopausal women)
- Family of CAD

JNCVII

- Age (> 55 for men, >65 for women < 65 or men < 55)
- Obesity (BMI >30 kg/m²)
- Physical inactivity
- Microalbuminuria or estimated GFR <60 mL/min

(HOPE trial *N Engl J Med.* 2000)

SECONDARY HYPERTENSION

- **Sleep apnea**
- **Chronic kidney disease**
- **Primary aldosteronism**
- **Renovascular disease**
- **Chronic steroid therapy and Cushing's syndrome**
- **Pheochromocytoma**
- **Coarctation of the aorta**
- **Thyroid or parathyroid disease**

SECONDARY HYPERTENSION

- **Drug-induced or related causes**
 - NSAIDs
 - Cocaine, amphetamines, other illicit drugs
 - Sympathomimetics, oral contraceptives, steroids
 - Cyclosporine and tacrolimus
 - Erythropoietin
 - Selected OTC dietary supplements and medicines (e.g., ephedra, ma haung, bitter orange)

TARGET ORGAN DAMAGE

- **Heart**
 - Left ventricular hypertrophy
 - Angina or prior myocardial infarction
 - Prior coronary revascularization
 - Heart failure
- **Brain**
 - Stroke or transient ischemic attack
- **Chronic kidney disease**
- **Peripheral arterial disease**
- **Retinopathy**

CLINICAL EVALUATION

- **Other historical factors that may affect treatment decisions**

- **Gout, sexual dysfunction, bronchospasm, migraine, heart block, pregnancy plans in female**

- **Physical Examination**

- **Goal is to assess for target organ damage and clues to secondary causes**

CLINICAL EVALUATION

- **Laboratory and other testing**
 - **Serum chemistries (fasting glucose, electrolytes, renal function)**
 - **Blood counts, lipid panel, urine analysis, EKG**
 - **Additional evaluations to consider include microalbuminuria, TSH, calcium, uric acid and echocardiography**

PREVENTION AND TREATMENT

JNCVI
Lifestyle Modifications

- Lose weight if overweight.
- Limit alcohol intake to no more than 1 oz (30 mL) ethanol (e.g., 24 oz [720 mL] beer, 10 oz [300 mL] wine, or 2 oz [60 mL] 100-proof whiskey) per day or 0.5 oz (15 mL) ethanol per day for women and lighter weight people.
- Increase aerobic physical activity (30 to 45 minutes most days of the week).
- Reduce sodium intake to no more than 100 mmol per day (2.4 g sodium or 6 g sodium chloride).
- Maintain adequate intake of dietary potassium (approximately 90 mmol per day).
- Maintain adequate intake of dietary calcium and magnesium for general health.
- Stop smoking and reduce intake of dietary saturated fat and cholesterol for overall cardiovascular health.

PREVENTION AND TREATMENT

JNCVII

Lifestyle Modifications

- **Dietary Approaches to Stop Hypertension (DASH) diet *N Engl J Med.* 2001**

Lifestyle Modifications

<u>Modification</u>	<u>Recommendation</u>	<u>SBP Reduction</u>
• Weight reduction	BMI <u>18.5-24.9</u>	<u>5-20</u> mmHg/10 kg wt loss
• Adopt DASH eating plan	-diet rich in fruits, vegetables, and lowfat dairy products -reduced saturated and total fat	8-14 mmHg
• Dietary sodium reduction	No more than 2.4 g sodium/day	2-8 mmHg

Lifestyle Modifications_{SBP}

<u>Modification</u>	<u>Recommendation</u>	<u>Reduction</u>
• Physical activity	Regular aerobic physical activity \geq 30 min/day, most days of the week	4-9 mmHg
• Moderation of alcohol consumption	No more than 2 drinks/day in most men and No more than 1 drink/day in women	2-8 mmHg

GOALS OF THERAPY

JNCVI

- **Goal BP:**
 - **HTN:** <140/90
 - **Diabetics:** <130/85
 - **Renal failure:** <130/85
 - **Proteinuria** (>1 gm/24 hrs): <125/75

JNCVII

- **Goal BP:**
 - **HTN:** <140/90
 - **Diabetics:** <130/80
 - **Renal failure:** <130/80

GOALS OF THERAPY

- **Base medication decisions on:**
 - **compelling indications**
 - **comorbid conditions**
 - **side effect profile**
 - **drug interactions**
 - **cost**
- **Always favor the long-acting formulations**

ANTIHYPERTENSIVE MEDICATIONS

JNCVI

- Uncomplicated HTN

- Diuretics
- β -blockers

JNCVII

- Uncomplicated HTN

- Thiazide diuretics
- Either alone or in combination with an ACE-I, ARB, β -blocker, or CCB

ANTIHYPERTENSIVE MEDICATIONS

JNCVI

Compelling Indications

- **Diabetes mellitus (type 1) with proteinuria**
 - ACE-I
- **Heart failure**
 - ACE-I, Diuretics
- **Isolated systolic HTN (elderly)**
 - Diuretics preferred, Long-acting dihydropyridine CCB
- **Myocardial infarction**
 - β -blockers (non-ISA), ACE-I (with systolic dysfunction)

ANTIHYPERTENSIVE MEDICATIONS

JNCVII

Compelling Indications

- Diabetes mellitus (type 1) with proteinuria

→ Diuretic, β -blocker, ACE-I, ARB, CCB

- Heart failure

→ Diuretic, β -blocker, ACE-I, ARB, and aldo antagonist

- High coronary disease risk

→ Diuretic, β -blocker, ACE-I, CCB

ANTIHYPERTENSIVE MEDICATIONS

JNCVII

Compelling Indications

- Post Myocardial infarction

→ β -blockers, ACE-I,
aldo antagonist (w/
HF)

- Chronic kidney disease

→ ACE-I, ARB

- Recurrent stroke prevention

→ Diuretic, ACE-I

ANTIHYPERTENSIVE MEDICATIONS

Additional considerations:

- **Diuretics**

- Compelling indications: DM, HF, high CAD risk, recurrent stroke prevention
- May have favorable effects on: osteoporosis (thiazides)
- May have unfavorable effects on: DM (hyperglycemia at higher doses), dyslipidemia (high dose), gout (> in men), hyponatremia (> in women)

ANTIHYPERTENSIVE MEDICATIONS

Additional considerations:

∀ β -blockers

- Compelling indications: DM, HF, post-MI, high CAD risk
- May have *favorable effects* on: atrial tachycardia and a-fib, essential tremor, thyrotoxicosis, migraine, peri-operative hypertension
- May have *unfavorable effects* on: asthma, 2nd or 3rd degree heart

ANTIHYPERTENSIVE MEDICATIONS

Additional considerations:

- **ACE-I**
 - **Compelling indications: DM, HF, post-MI, high risk CAD, chronic kidney disease, recurrent stroke prevention**
 - **May have unfavorable effects on: hyperkalemia**
 - **Contraindicated in pregnancy**

ANTIHYPERTENSIVE MEDICATIONS

Additional considerations:

- **ARB**
 - **Compelling indications: DM, HF, chronic kidney disease**
 - **Contraindicated in pregnancy**

ANTIHYPERTENSIVE MEDICATIONS

Additional considerations:

- CCB
 - Compelling indications: DM, high CAD risk
 - May have *favorable effects on:* Raynaud's syndrome and certain arrhythmias

ANTIHYPERTENSIVE MEDICATIONS

Additional considerations:

- **Aldosterone antagonist**
 - **Compelling indications: HF, Post-MI (w/ LV dysfunction)**
 - **May have unfavorable effects on: hyperkalemia**

QUESTION

The following are statements about the use of diuretics for the treatment of HTN:

True or False

A) Diuretic therapy has been demonstrated to decrease mortality rates in patients with HTN

True

B) Thiazide diuretics have been shown to reduce the incidence of stroke in elderly individuals with isolated systolic HTN

True

QUESTION

C) Thiazide diuretics have been demonstrated to be as effective as the CCB amlodipine or ACE-I lisinopril in preventing nonfatal MI

True

D) When combined with other classes of HTN meds, low-dose diuretics can improve BP control

True

E) In patients with HTN and normal renal function, loop diuretics, such as furosemide, are generally more effective than thiazide diuretics

False

From: AAFP Core Content Review of Family Medicine 2003

TREATMENT

- **ALLHAT trial**
 - **chlorthalidone was as effective as amlodipine or lisinopril in preventing fatal CAD and nonfatal MI**
- **Diuretics have been shown to:**
 - **decrease mortality in patients with HTN**
 - **reduce incidence of CV events and stroke in the elderly with isolated systolic HTN**

TREATMENT

- **Thiazide diuretics → not as effective in patients with creatinine clearances below 30 - 50 ml/min**
- **Loop diuretics → less effective than thiazides for patients with HTN and normal renal function**

ALLHAT

The Antihypertensive and Lipid Lowering Treatment to Prevent Heart Attack Trial

- **Study design: randomized, prospective, double-blinded over ~five years**
- **Population: 42,418 individuals > 55 y/o with mild (Stage 1 or 2) HTN with at least one other CV risk factor - randomized to one of four arms**

ALLHAT

- Intervention: 3 arms
 - 1) CCB - amlodipine
 - 2) Alpha-blocker - doxazosin
 - 3) ACE-I - lisinopril
- Control:
Diuretic - chlorthalidone

A second drug could be added to achieve BP control (atenolol, clonidine, or reserpine)

ALLHAT

- **Outcomes measured:**
 - **Primary outcomes: fatal coronary heart disease and nonfatal MI**
(no difference between between the drug groups)

MORE QUESTIONS

Which one of the following antihypertensive agents can be given to diabetic patients without adversely affecting glucose metabolism?

- A) Hydrochlorothiazide**
- B) Chlorthalidone**
- C) Prazosin**
- D) Propranolol**
- E) Diazoxide**

Answer:

C) Prazosin

- **Prazosin, a peripheral alpha blocker, has no known adverse effects on glucose tolerance**
- **Thiazide diuretics and Diazoxide can worsen hyperglycemia**
- **\forall β -blockers may induce or mask hypoglycemia**

MORE QUESTIONS

A 50 y/o WM with elevated cholesterol requires medication for HTN. Which one of the following can adversely affect the lipid profile?

- A) ACE inhibitors**
- B) Calcium channel blockers**
- C) Alpha blockers**
- Δ) β -blockers**

Answer:

D) β -blockers

**\forall β -blockers can raise
triglycerides and lower HDL**

- The other drugs listed have no
adverse effects on lipids**

MORE QUESTIONS

A 40 y/o man currently being treated for HTN abruptly stops his medication. He presents to your office with significantly elevated BP, palpitations, anxiety, and headache.

The patient was most likely taking

- A) prazosin**
- B) clonidine**
- C) hydrochlorothiazide**
- D) hydralazine**
- E) captopril**

Answer:

B) clonidine

- **Withdrawal of clonidine may produce a hypertensive crisis**
 - **Accompanied by signs and symptoms consistent with sympathetic overactivity**

Questions?